Introduction

Currently, side-by-side off road vehicles utilize frames made mostly of steel. Because the frame is 100% welded, the entire chassis is often replaced if a part is damaged.

Structural bonding can be used during chassis manufacturing to address this problem.

Advantages

- Faster, cheaper, easier repairs
  - Damaged parts can be removed and replaced
- Reduction of structural heat damage and hazards associated with welding
- Optimization of weight, cost, and strength through use of various materials in different sections of the frame

Random Vibration Analysis

- MIL-STD-810G used for analysis inputs.

Comparison of random vibration FEA analysis on welded OEM chassis (left) and improved, bonded chassis (right)

3D model of improved chassis showing steel sections (light gray) and aluminum (darker gray)

FEA Loading Scenario per MIL-STD-810G

- 65% off-road
- 1/3 of off-road is severe
- Fatigue is the failure mode
- Average speed is 26 km/hr (16 mph)

Plot of random vibration inputs

Joint Testing Results

- Lord 406/19 chosen for the adhesive
- Yield stress for welded and bonded joints was similar

Stress vs strain plot of joint test data for one welded (red) and two bonded joints

Chassis Testing

Chassis was loaded at white arrow to determine stress and deflection characteristics, for comparison to OEM chassis

Bonded Joints

- Lord 406/19 acrylic adhesive
- 12-17 minutes to handling strength
- Fully cured in 24 hours
- Heat to 400°F to detach joints
- Corrosion resistant

Plot of random vibration inputs